



The Biology Curator



Issue 21

December 2001



The Future of Collecting/Collections of The Future – 2001 AGM Papers
Reviews—NHM Pest Course; Fluid Preservation Seminar
Regional Museums Task Force—a curator responds

News

Biology Curators Group Study Trip to USA February 2002

Having tentatively booked 40 plane tickets I was relieved to find that the quota was filled within a couple of weeks and that there is at present a waiting list of eight.

The tragic events of September 11 have meant that we have had to change our departure airport to Heathrow, since Virgin are pulling out of Gatwick at least for the time being.; I don't think the change will inconvenience anyone - except me. Only one delegate has cancelled as a direct result of the terrorist attack.

Biological warfare permitting, I will be making the final (unrefundable) payment at the end of December; the itinerary and hotel details will be sent out to all paid up delegates at the beginning of January.

Kathie Way

Meetings

Biology Collections and Lifelong Learning April 10th - 11th 2002 Newcastle University

Call for Papers

The subject of the 2002 AGM will be lifelong learning. Life long learning is a comparatively new phrase and one increasingly used in

museums, education organisations and funding bodies literature. This conference will aim to explore what we mean by life long learning and look at the issues, theoretical aspects and practical projects relating to biology collections and the life long learning agenda.

Anyone wishing to present a paper, demonstration or poster please contact:

Nick Gordon, New Walk Museum, New Walk, Leicester, LE1 7EA
Phone: 0116 2554100
Email: gordn001@leicester.gov.uk

SPNHC AGM 2002

The Society for the Preservation of Natural History Collections will be holding its 17th Annual Meeting May 8 - 13, 2002 at the Redpath Museum/McGill University in Montreal Canada.

The Redpath Museum/McGill University is co-sponsoring the meeting with the Canadian Museum of Nature (and one of the field trips will be to CMN's "new" storage facility in Ottawa). The meeting will feature technical sessions, a keynote speaker and the workshop on May 13 being: Chemical and Biological Emergency Preparedness and Response in Natural History Museums.

The social programme includes field trips to the collection facility of the Canadian Museum of Nature, near Ottawa, a UNESCO Biosphere Reserve, local Ordovician quarries and the world famous Biodôme. For more information regarding program updates, registration and abstract submission information visit the SPNHC website at:

www.spnhc.org/2002

Or write to:
SPNHC 2002, Redpath Museum/McGill University, 859 Sherbrooke Street West, Montreal, Quebec, Canada, H3A 2K6

Fenscore II: *the awakening*

Dear BCG colleagues...

We want to put an HLF bid together to update, extend and promote FENSCORE, all the things we've wanted but never done – because of the day job!

We are hoping to get a bid in during spring 2002 but we need a fast consultation **now** over what the priorities are – **so we want your help** if you have an interest in promoting knowledge and information about natural history collections.

In case you've forgotten the UK Natural History Collection Database based at Manchester, and soon, Nottingham, can be viewed at www.man.ac.uk/fenscore. ...; if you want to be kept informed of progress then you can subscribe to the FENSCORE mailing list from the website.

This database points to the vast majority of the UK natural science holding outside the national museums - we estimate some 100 Million specimens, more than held at the Natural History Museum in London!

Some ideas

We wish to develop this database as both a research and life-long learning tool, by:

1. updating and expanding the range of data
2. linking the national database to local databases held locally, adding personal points of contact and expertise
3. improve the data structure to make searching more effective
4. create a front end that can be used by school students and mature students alike, that they want to use, by adding images and current information and links
5. promoting interest in detailed knowledge of natural history, especially UK natural history, by increasing the use of local collections by local people, developing local research and data validation projects and identification

6. expertise.
identify orphan collections that need immediate rescue, and the new collections being made by active living naturalists that could be potential museum collections of the future.
7. Promoting the use of the FENSCORE data, seeking links with like websites etc
8. Identifying value-added products, e.g. specialist summaries of the national holdings of taxonomic groups.
9. Identifying the means of long-term maintenance of the FENSCORE data to protect and promote the national resource with local collections.

We have had initial discussions with the National Biodiversity Network who recognize the importance of local collections and we will want to facilitate the use of collections within the NBN as a priority. We shall be having further discussions with them early in 2002.

How you can help

We'd be grateful for any comments and ideas. This is an important attempt at improving access to your collections from a national database so please send your comments and ideas to the email addresses below or the FENSCORE mailing list above. We want to get our initial ideas together by Christmas so contact by **24th December 2001** would be the most helpful, especially about local community connections and use of your collections.

thanks

Graham Walley (Chair)
peg9000@hotmail.com
and grahamw@notmusbhy.demon.co.uk

Charles Pettitt (Data Manager)
c.pettitt@man.ac.uk

Request for Information

The Natural Sciences section at Leicester City Museums were recently approached by the Bursar of Uppingham School, Rutland

enquiring about some exotic birds.

An elderly lady, who was the daughter of an old boy of the school, has enquired after a collection of exotic birds her father loaned to the school in 1916/17. There were four cases measuring 6' x 6'. The school were unable to locate them but thought that in the 1970's a Headmaster had donated them to a local museum. The collection was not donated to Leicester Museums and has not turned up at any other museums in the area.

If you have any information regarding these cased birds could you please contact:

Miss SA Buxton, Bursar, Uppingham School,
Uppingham, Rutland, LE15 9QB.
Tel: 01572 822216 ex 4006

Erratum

In issue 21 of The Biology Curator Kim Goodger's paper on Conservation of Birdwing Butterflies was unfortunately truncated. This was due to the acting editor getting to grips with some new software being used to produce The Biology Curator so my humble apologies to Kim. The missing section is reproduced here.

Conservation of Flood Damaged Birdwing Butterflies.

Kim Goodger.
Dept of Entomology, The Natural History
Museum, Cromwell Rd, London. SW7 5BD

Materials used.

Glassine envelopes - BioQuip Products, Inc.
17803 LaSalle Ave, Gardena, CA 90248
USA.

Seccotine(tm) liquid glue - Distributed by
Primrose Repair Services, Dunstable Road,
Dagnall, Berkhamsted, Hertfordshire HP4
1RQ

Stainless steel entomological pins with nylon
head, 'continental' length size 5 - Watkins
& Doncaster, PO Box 5, Cranbrook, Kent.
TN18 SE2

L2S lens tissue; machine made (Manila hemp,
jute ash, woodfree), white, wove 9 gsm -
Falkiner Fine Papers 76, Southampton Row
London WC1B 4AR

Acknowledgements

I would like to thank Kate Edmondson, Conservator, Dept Library and Information Services, The Natural History Museum, for her advice on which type of paper to use, and Harrow School for allowing this report to be published.

References

- d'Abrera, B. 1990. Butterflies of the Australian Region. Third, revised edition. Hill House.
- Dickson, R. 1976. A Lepidopterist's Handbook. The Amateur Entomologists' Society.
- Florian, M.L. 1997. Heritage Eaters. Insect & Fungi in Heritage Collections. James & James, London.

Regional Museums Task Force Report

The Regional Museums Task Force report, *Renaissance in the Regions: a new vision for England's Museums*, is now out.

The 9 strong task force consulted over 400 people, including BCG, throughout the museums sector. The report identifies a number of problems being faced by museums including:

- Fragmentation of effort between a large number of institutions
- Under-funding
- Staff shortages and low morale
- Decline in scholarship
- Weak leadership

The report recommends that a major museum service, a 'hub', linked to a number of partners, should be formed in each of the 9 English regions. The hub would be selected based on a number of criteria including collections, status, location, infrastructure and evidence of achieving good practice. The hubs would provide leadership and support for other museums in the region.

A framework to be implemented over a 5 year period has been costed at £267.2 million. The majority of this would come from central government and be used to:

- Increases staffing levels by 25%
- Develop access, outreach and education programmes
- Develop temporary exhibitions

- Develop IT resources
- The report is not a consultative document and it stands or falls as it is. A preliminary response is being submitted to DCMS by the end of the year and many services are already actively engaged in developing partnerships to bid for regional hub status.

It is strongly recommended that BCG members are aware of this report and the huge potential changes across the sector that may result with its implementation.

Copies of the report were sent to all registered museums. The full report and a summary report can be downloaded as a pdf file from www.resource.gov.uk

Hard copies of the report are available from Nick Morton on 020 7273 1458.

Renaissance in the Regions? A response to the Regional Museums Task Force Report

Steve Thompson

This is a personal response on the part of the Secretary of the Biology Curators Group (BCG). The views expressed are personal ones should not be taken to be those of the BCG.

Introduction

It should be said at the outset that there is a great deal to be welcomed in "Renaissance in the Regions", the recent Regional Museums Task Force (RMTF) report. The Museums Association has already discussed the welcome aspects of the report, and there is no need to repeat what they have said here. However, the proposals and recommendations could give serious cause for concern amongst those working in smaller museums. (By smaller museum, we mean here all medium-sized and smaller museum services, roughly 1840, or 98.9% of the non-national museums community). This report could be seen as a Beeching Report for museums, and parallels with the evolution of the railway system since that report would be easy to draw.

Before going any further, it should be pointed out that there has been a certain misrepresentation of the curators themselves. We do not feel ourselves to be demoralised.

We certainly have the will, the imagination and the ability to do all that is being asked of us. However, we are chronically under-resourced and grossly overstretched, and so feel very frustrated. The findings of this report give the potential for doing much to change that situation, but the proposals and recommendations seem more likely to aggravate it. Furthermore, there is an enormous wealth of talent, experience and expertise outside of the national and large regional museums that has simply not been acknowledged.

Biases

I will look at the two principal areas of concern only. The first, and somewhat smaller, concern is the subject bias that the RMTF has placed on the report, in concentrating on art and social history, and on the preservation and interpretation the past. This is a gross distortion of the true range of museums interests and activities. Of the 21 projects cited as exemplars, 18 are art or history projects. Of the remaining three, only one is a project that directly concerns the collections themselves. Otherwise there is no reference to technology/industry museums, and no reference at all to science, natural history or archaeology, even though many of the most innovative schemes have been developed within these sectors. Not only is this a misrepresentation of the museum community itself, but also of the user community.

To get an idea of where public interest lies one may look at the most popular "cultural" pastime of all, watching TV. Of those subjects of direct concern to the museum community, a count of programmes over four recent, consecutive weeks shows that there were just 9 arts programmes (not counting "pop culture", which museums generally choose to ignore), as opposed to 20 science programmes, 43 archaeology / history programmes (they overlap too much to separate out) and 66 natural history programmes. It is disturbing, therefore, to see a major report showing such a strong bias, (though understandable when one looks at the make up of the task force).

Furthermore, museums also look at the present

table, table 8, describing the key deliverables, there is no reference to any relationship at all between the hubs and the rest of the museums. All of the deliverables, as described, could be met from within the hubs themselves. In Table 16, certain responsibilities are outlined, but there is no indication of how to ensure that the hubs will meet these responsibilities.

Then there is an implication that the smallest museums, often in small and remote communities, and with very low capacity, would be expected to transfer their collections to a central collection resource centre. Without collections, they are likely to close, as they would then have no resource to draw on. It seems unlikely that the hubs will then provide an outreach service to a community without a museum service, leading to a potential catch 22 situation. Even more worryingly, all collecting activity in that area will also cease. It may even be that much of the collections could be disposed of, as, divorced from their local context, they could be seen to duplicate other material in the central resource. This would result in a net loss of local heritage, and cultural identity, and a homogenisation of national heritage.

This could be avoided by employing a regional strategic organisation, whose self interest is not in conflict with its roles, and which has the appropriate authority. It would direct or withhold funding according to their monitoring of the performance of any institution receiving funding, including the hubs. One might envisage relatively small, autonomous organisations, who will answerable only and directly to Resource. They would deal with the strategic implications of its regional museums network and have a good overview, as well as a detailed knowledge of each part of that network.

The large regional museums, on the other hand, are already large and complex organisations, whose own self-interest is not necessarily congruent with that of the regional network. Furthermore, they are part of a much larger organisation, the local authority, which has its own needs to meet. The museums, in becoming partly directly funded by central

government, via Resource, would then be answerable to two different masters, very likely leading to a conflict of interests.

Re-assessment

There is a strong argument that AMCs should be reconsidered for the role of strategic regional authority, as they already fulfil the criteria. Furthermore, it is not clear why capacity building of the AMC should result in a more bureaucratic organisation. Increased bureaucracy comes about either by an increase in the number of people at the senior, decision making levels, by reducing the efficiency of communications across an organisation, or by increasing the number of levels of hierarchy in the organisation, thus reducing the efficiency of communication up and down the organisation. There is no reason, however, why either of these things should take place. In their new and expanded role, the AMCs would be responsible for creating and implementing a regional strategy. Secondly, they would be responsible for directing the additional funding from Resource to the most appropriate destinations (probably as already envisaged). Thirdly, they would be responsible for monitoring and developing the strategy, including monitoring the performance of the institutions within the region. As they perform these functions now, the AMCs already possess the required functionality. There should therefore be no need to increase the number of departments and the number of senior managers. There will indeed be a considerable extra work burden, but this will essentially be procedural rather than decision making. This could be accommodated by increasing the capacity through increasing the number of people within the existing lower levels of the organisation, where this kind of work is already carried out. Overall, this would result in AMCs with an increased capacity, but operationally as lean and focused as at present.

As this system is already in place, and the AMCs already know their community, the hub system could be up and running in its initial form within a year, rather than in three years, as the current proposals suggest. This would surely be more favourable to central government funders, as well as giving the

chance of a much better consolidated system at the end of the initial five years being proposed.

Final Observation

A final observation concerns who should be a core or satellite organisation. While a large regional museum would almost certainly be the best choice as the core, the geographic location of the satellites, in terms of providing a service out to the other museums in the region, is very important. This is especially so when considering geographically large regions, such as the North West, Yorkshire and the South West, where outlying communities can be a hundred miles away from the centre of the region. In practice, this will make little or no difference to the core organisations, who will almost certainly be the same whatever options are finally followed. However, some satellites may be different under the different proposals. Furthermore, there seems to be no particular reason why the number of institutions chosen should be limited. It should be for the regional strategic authority to decide on the structure, size and composition of the hub. The drive to avoid dilution of any additional funding across too many institutions should be sufficient to ensure that a suitable compromise is reached. However, some of any additional funding should be directed to appropriate institutions outside of the hub. Support in the form of advice, surveys, expertise, and so on, is all very well, but the crucial factor will still remain lack of capacity, which can only be addressed by additional material and financial resourcing. As the report itself says "it is difficult to be resourceful without resources"

Overall, the findings of the report are to be welcomed, but the proposals and recommendations should be seriously reconsidered if it is not to have an effect contrary to that intended. The above discussion assumes that one of the two principal alternatives considered will be implemented, but it may be that further investigation will produce an alternative that is better than either of these.

Steve Thompson, BCG Secretary and Keeper,
Natural History, North Lincolnshire Museums.

Museums Association Conference

29 - 31st October 2001

**Queen Elizabeth II Conference Centre,
London**

The Biology Curators Group hosted a session at the MA conference this year on the subject of museums and biodiversity. The session was quite well attended and was up against some hot competition from concurrent sessions. BCG also had a stand in the Market Place where we were able to showcase the new BCG display panels.

The following is the abstract for the meeting and one of the talks presented..

Museums, Biodiversity and Community Biology Curators Group

This is a current hot topic, with concerns riding high at all levels of society over the state of our environment. Museum collections and databanks are vital to biodiversity research. They are key to educating and raising awareness amongst the public and in promoting community involvement in the care of their local environment. This session will look at the activities of a key biodiversity action group and the pivotal role that museums play in fostering essential links between communities and their environment.

Convener:

David Carter

Chair Biology Curators Group

Speaker(s):

Trevor James, Biological Records Centre

Nick Gordon, Leicester City Museums

Caroline Holmes, Holly Hayes Environmental
Resource Centre

Natural History Collections and Biodiversity: an outsider's view?

Trevor J. James

1. Introduction

Whether or not you would consider me an

outsider might depend on what you know about the National Biodiversity Network.

When I was asked to make this small contribution to the Museums Association Conference, I was a Trustee of the NBN, and ran the local biological records centre in Hertfordshire, based in a County planning department. At one time I was also Keeper of Natural History in a local Museum Service. I am still in touch with the museum profession, because I remain an Associate of the Museums Association!

The real reason why I was asked to come was also because the NBN has made a contribution to the deliberations of the recent Resource report on the funding of museums, especially about the importance for biodiversity of natural history collections.

2. Natural History Collections

Our natural history collections across the country must run into millions of specimens. But how often do we actually ask ourselves why we have got them? Having worked in a local museum, I can say that the reasoning behind so many collections has been nebulous to say the least, especially in the past, which will not have helped in getting better recognition.

As for understanding and being able to demonstrate what they consist of, the work of curators over the last 20 years or so has made some inroads into this, through the Collections Research Units and modern data management. But how much of the detail of this work surfaces in the minds of those with the purse-strings? Does the detail tend to obscure the basic message?

As for the users of collections, how many museums have taken a broader look at the potential role that natural science collections can have? While high tech interpretative skills have been put into many an in-house display, how many museums consider the broader role of such collections in relation to what is going on in the world outside? It is this theme which I want to explore, especially in relation to the way "biodiversity" has become a big issue.

3. Museum Collections as a "Biodiversity Resource"

I believe that these collections have four main reasons for existence.

The first of these, lumped as "education" and "demonstration", I would say are two sides of the same coin – showing people at large what natural history is all about, and illustrating the diversity with real examples. This is obviously one of the most highly visible activities of any museum, and as such, I don't want to talk about it any further, as others will be or have been doing so!

The other three functions, I believe, are equally important, but tend to get forgotten within museums in the rush to get the work done, and disregarded by those holding the purse strings, especially in local museums. There is also a very strong element of thinking that, if it is not directly related to the interests of the immediate "customers" of the museum – those coming through the front door of the gallery in particular, then it is not very important.

It is this "bigger picture" which I want to explore, and which I think can show the way to broadening the recognition of museums, and perhaps their funding.

4. Documenting the Natural Environment

What do I mean by this?

When I first joined a local museum, I was struck by two things – firstly the enormous amount of local support for its collections by what I would call the local "interested and dedicated public", and secondly, the incoherent way that the museum responded to their needs.

What I was seeing was the recognition by a relatively small band of people in voluntary societies that the museum performed an incalculable service to them in providing a "home" for the material they had researched locally, and which could then be used by others.

I would say that most collections of local

natural history material originated in this way. The result is that many such collections (not all, if we include the “foreign memorabilia” type of collection) are an invaluable source of information on the natural history, in its true sense, of the local area.

So, what role and functions can such collections now play:

Firstly, they tend to confirm what occurred where and when. There is nothing like a real specimen with a good label to be an unanswerable piece of evidence. “What’s hit is history; what’s missed is mystery” used to be the saying, with some truth! In saying this, I would emphasise again the importance of the “good label”!!! I am sure all museum people here would thoroughly agree.

Secondly, we need to be clear that collections of this kind can be **primarily** an archive. They are not there to be plundered for displays – in fact in most cases they are thoroughly useless for such purposes.

There are aspects of natural history collections which also tend to get forgotten about, even by museum curators in some cases. While the labels may be good, what about the associated written records? How many museum natural history curators have an active policy of collecting natural historians’ field notebooks, maps, annotated books, photographs, or, nowadays, computerised data? If they do collect them, do they maintain them in the way that an archivist would? Or are they given second-class treatment after the fine insect cabinets? Are the collections in the cabinets firmly linked in information systems with the written archives that came with them? Further than this, how often are natural science collections recognised by and linked with data on e.g. local history about the same area?

All these aspects are important in the process of ensuring that collections are a genuine tool for the “documentation” of the local or regional natural environment and its changes. Now that the importance of a genuine historical perspective on the environment is becoming more widely recognised, this

function, I believe, is certainly as important as, and probably eventually will become even more important than the demonstration and display roles. If not, then I think museums will have missed the point.

5. Verification and validation

I have already touched on these functions, but I think there are more activities here than most might realise.

Obviously real preserved specimens have always had a central role in the processes of taxonomy. So, the first point here is probably only a reminder to biological curators themselves that this is important, should they need it! But there are two related issues. Firstly there is the confirmation, or otherwise, as to whether the biological record is accurate. Secondly, there is an equally important role in relation to our ongoing understanding of the natural world. In Britain, there is a steady if not massive amount of work going on which requires natural scientists to revise their thinking on what species consist of. In other parts of the world the basic taxonomic task is still enormous. Museum collections, of course, not only allow work on that revision to take place (coupled now with molecular work elsewhere), but also allow people to go back to the original material and see where changes in records are needed. Without museum reference collections, such work becomes next to impossible (unless you rely on field notes or photos, as with birds!)

The corollary of this, therefore, is that museum collections are vouchers for other data. Here is where my interest in biological recording really comes in, and where the NBN has a vested interest. It is all very well having a vast amount of electronic data available at the touch of a keyboard, but where is the meat? How can we be sure that this record of a beetle actually refers to that species rather than another? In many cases we have to accept what we are given, but in important cases, it is only acceptable to state the record if it is backed up by a properly named specimen. These have to be kept somewhere, at least for a good while (and even if techniques like holography are

acceptable in some cases). And this is where museums must come in. We are undertaking more and more survey work for “biodiversity” – but who is thinking about looking after the vouchers? Where is the local or regional storage facility to make sure all our knowledge is not built on hot air or electronic bunkum?

This, again, is a hidden but extremely important role of museums which has been overlooked or disregarded by funding bodies for far too long, partly because those who are interested in the “records” are now more often than not in separate institutions from those who look after the vouchers. There has been a divorce between providers and users, with neither fully recognising the fundamental importance of the use.

6. Research

Natural science collections therefore are not just static assemblages of objects. They have a function in relation to ongoing studies, and are the back-stop against which our scientific understanding of the environment rests.

These roles, and that of being a part of the research process itself leading to new knowledge are of course all part of a continuum. Or, at least, they should be, if the museum is functioning properly.

How should museums be considering these roles? Natural science collections are almost unique in museums by virtue of what they consist of: individual (formerly) living entities, from a specific place and at a specific point in time, hopefully collected with information on known relationships to other living things and the environment in which they lived. This uniqueness of the individual is both the strength of their value, and a source of problems in their upkeep. For the greatest potential value, the importance lies in the overall, collective detail linked to the scientific sample with its associated data. The sheer bulk of the individual specimens and their fragility leads to the well-known problems of storage associated with natural history collections! It is not entirely surprising that museums have tended to forget the research roles in the face of dealing with

problems of curation.

Nevertheless, the research role must remain a highly significant potential. The specimens are historic samples. They individually, and, even more so collectively, form a window on the environment at a particular time. If this data is accessible, it is a very powerful tool in developing further insights, not least with the advent of new methods of analysis – DNA profiling, isotope analysis, etc. Obviously not all collections will have this kind of potential – much will depend on the level of associated data, and the quality of the material. But even in the lowliest local museum natural history collection, as long as it has associated data there will be opportunities for new insights.

Natural history collections, therefore, are the material which can confirm and support scientific understanding. They are the bedrock of knowledge, and a tool for future study.

7. Collections as the Archives of Science

Why are our natural history collections, therefore, so often seen as inconvenient cinderellas, especially as compared with the “value” of cultural objects in museums?

There has always been a bit of a mantra among museum curators that they should be engaged in at least some “research” around their collections. After all, that was one of the reasons why interested people wanted to join the profession in the first place – not to become paper-pushing bureaucrats, or entertainers, but to develop their knowledge and that associated with the collections in their care. I would suggest, though, that so often museums have failed to grasp the need for such activity to be closely tied in with modern advances across the board in the subjects they deal with, and none less than in the natural sciences. The result has been that the collections become abandoned because their function is lost to other institutions, while those other institutions have no real grasp of the need to maintain collections, let alone the resources to do so. We end up in the ridiculous position of having researchers bemoaning the lack of historic data for lack of

past material to study, while museums bemoan the problem of dealing with vast stores of historic specimens with the lack of their effective use!

So, in response to the points I have listed here, I would categorically emphasise that any museum which considers its natural history collections in the first category is failing in both its collecting and curatorial policies and in its duty to the public!

There are sometimes substantial elements of collections which fall into the second category. We need not belittle this too much. Arousing interest is a very important thing. But it is not the central *raison d'être* for most mainstream collections.

I would say that the last two categories are highly important, and have tended to be seriously neglected. But to fulfil their potential, we need some lateral thinking, some linkages with other interested parties, and some concerted effort.

If we don't succeed, then our country will be the poorer in the long-term understanding of our natural heritage. With the availability of modern electronic information systems, and the means of associating such collections with those areas of activity which badly need their input, we have no excuse now not to press successfully for their support.

8. Where do we go from here?

You may well ask! It is all very well my standing up and saying my piece, but I can only reflect how many times the Biology Curators Group and others have done the same since I first became involved in the subject in 1973!

However, I do believe there are significant opportunities in the pipeline which will offer some way forward, if we have the collective will to develop them.

I would say that the museum biological curators need to work with outside agencies, like my own, to present a coherent case. There needs to be a short, pithy, strategy based on the points here:

- Get the role of natural science voucher collections recognized on a regional basis at least. The proposals for "regional centres of excellence" may be a way forward, but the "regions" don't want to be too big, or the links with local knowledge and expertise will be lost. There would need to be a balance between available skills and resources on the one hand, and this local link on the other.
- There have been some excellent recent publications on the care of collections, but what is needed, it seems to me, is a more broadly supported set of standards which involve not only the museums themselves but the other organisations and institutions which need to be involved if these collections are to be seen to be useful.
- Part of this process is getting the museums profession as a whole, as well as its funding bodies, to understand that there is a legitimate role of museums as archives of such material, and that this can be a source of strength, not a diversion. The preparation of a joint strategy with outside bodies may be one way of doing this – showing that other institutions and interested parties have a legitimate stake in the museum, not just those interested in education or "outreach".
- Recognition of linkage with outside needs will require museum professionals to actively forge links with those organisations that might be involved. Natural science societies, research institutions, conservation agencies, and the National Biodiversity Network, are examples. In some cases, such links are already there to some extent, but much more needs to be done, especially at senior levels.
- The Cinderella of cinderellas has always been the natural history documentary archive. So often it is forgotten, even where the specimen collections are well-maintained. I have shown how important these can be, and so there needs to be a greater forging of links perhaps with the Archivists profession at least, and even libraries (dare I say it?) in developing systems of management, and with information scientists generally in propagating their use.
- Finally, I think more creative thinking, in relation to outside uses and potential partnership working, needs to be given to the role of electronic documentation. This is

particularly important because of the potential role of voucher collections in support of biodiversity data. The National Biodiversity Network has recognised this potential since its inception, but so far there has been little integrated thinking as to how this role could be developed effectively.

With the advent of the NBN, there has been an increasing awareness of the need to encourage higher standards of data collection by those involved in recording wildlife. Part of this process must involve the quality of identifications, and the support of these identifications by voucher specimens. As was pointed out above, the housing of such collections is vitally important, and therefore the NBN has a real interest in encouraging partnership approaches to the designation of such repositories across the country. The development of local information networks around local biological records centres is one aspect of such work, but the parallel development of natural science archives and resource centres ought also to be on the agenda.

There are opportunities in all this for support. It may not be immediate, but the linkage with the interests of the NBN may help in developing bids to bodies such as the Heritage Lottery Fund for support. The NBN has so far agreed a strategic approach to involvement of the voluntary movement in biological recording as a basis for making bids to the HLF. The role of museums in acting as repositories of volunteer survey material or archives could well be a very legitimate extension of this. Further thought as to how this can be developed would be needed, but what is clear is that "joined-up thinking" (all the rage now of course) is needed, and that real partnerships need to be forged between museums and the rest of the biodiversity community. In this way biological collections might, again, be seen as a real resource for the community at large, not just an albatross around the cultural museum curator's neck.

Trevor James
**NBN Development Officer for Recording
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A SYNOPSIS (WITH ADDED PERSONAL THOUGHTS) OF THE FLUID PRESERVATION SEMINAR, HOSTED BY HAMPSHIRE COUNTY COUNCIL MUSEUMS SERVICE ON 7TH NOVEMBER 2001.

The seminar titled 'Fluid preservation – do we really understand it?' was hosted by Hampshire County Council Museums Service at their headquarters, a converted farm called Chilcomb House on the outskirts of Winchester. Simon Moore and his colleagues had arranged a number of interesting talks and demonstrations. In addition, there was a handling display of ground glass and storage jars from Stoelzle-Oberglas, the company who had sponsored the seminar, plus a display of fluid-preserved material in various media dating back to 1957. We were also presented with files, stuffed with interesting papers and information relating to the talks.

The seminar was divided into three parts - the biomechanics of fixation and preservation, more specific areas such as rehydration agents, and practical demonstrations. After an interesting welcome speech by Stephen Locke, the Director of Hampshire County Council Museums Service, Simon gave a brief history of fluid preservation. He then outlined the processes of fixation and preservation, and discussed 'new' preservatives, such as Opresol. Julian Carter (National Museums and Galleries of Wales) gave a talk on the biomechanics of formaldehyde with alcohol fixation, and a brief outline of DNA fixation and storage in alcohol. What I found most interesting was the difference between 'true' and 'pseudo' fixatives, where true fixatives create chemical cross-linking, whereas pseudo fixatives merely denature/coagulate. Although I found Julian's molecular diagrams a little hard to follow, as I had given up chemistry in the second year at senior school, I was left feeling that I wanted to find out more about the chemistry of the collections that I curate. I also felt safe in the knowledge that I know who to call if things get tough!

Simon then talked about the histological effects of fixation and long-term preservation, as well as whether preservatives are beneficial or not. I found this all very interesting, as I have only ever seen the effects of poor fixation/preservation at the 'whole specimen' level. Next, Maggie Reilly (Hunterian Museum, University of Glasgow) gave a review of current rehydrating agents. Contrary to my expectations that she would tell us about a definitive rehydrating agent, I was surprised to learn that the subject is still in some ways, at the 'drawing board' stage. This left me feeling very enthusiastic about following up some work that I had done three years ago, where I had compared sodium tri-phosphate and Decon 90 as possible rehydration agents for Arachnida and Myriapoda specimens. Maggie had very helpfully provided a reference list, which will come in useful.

Clare Valentine (Natural History Museum) talked about the move of the Zoology collections into the new Darwin building at the NHM's South Kensington site. It was very interesting to hear about her experiences and compare them with those of the Entomology Departments' team, as we had also taken part in moving collections into the same building. However, Clare's involvement in the actual move was much greater than ours. Jenny Bryant (NHM), was the last speaker for the morning session. She talked briefly about the fluid preservation of plant specimens and which are the most effective agents. It transpires that the NHM still uses traditional methods, like so many institutions, but there is a need for experimentation with modern preservatives.

After a fantastic lunch (the best I've ever consumed at a conference!), we split into groups for the practical demonstrations. Christine Taylor and Chris Palmer (Hampshire) took us around their biology store. Amongst other interesting specimens, we saw the superb fungal collection that Simon had freeze-dried, and well-preserved birds in beautifully painted display cabinets, which depicted scenes from the Hampshire area that existed over one hundred years ago. What I found particularly nice, is that the collections are used to train local people, such

as wardens of nature reserves.

In the workshop area, Christine demonstrated the transference of formalin-preserved material to alcohol (IMS). Simon demonstrated the Celloidin mounting technique, and 'volunteered' several people to try their hand at attaching snail shells to glass back plates! Simon also demonstrated the drilling of glass lids and back plates. Back in the meetings room, Julian demonstrated the use of a Density Meter for determining the concentration of ethanol/water mixtures. Simon also showed how to distinguish formalin from alcohol by using the 'map pin' technique. Andries van Dam (Leiden Museum) had brought along some packets of plastic 'pills', which are used in much the same way as Simon's map pins. The different coloured 'pills' float or sink depending on the type of fluid and its concentration, and can be left in specimen jars for monitoring purposes. At this point, delegates had to rush to get their trains, so the day's events were over.

I think that this seminar was a very worth while event. Sometimes it is quite easy to feel that you are working in isolation, although when you attend a seminar such as this, you realise that there is a community of people working to a common goal and the enthusiasm for the subject is tangible. The importance of these seminars therefore, doesn't just lie in the words imparted, but in the people who impart them. My initial answer to the original question 'Fluid preservation – do we *really* understand it?', changed somewhat through the course of the day. After hearing all the talks, my answer now is 'no we don't, but we are trying our best to get there!'

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2001 : A Pest Odyssey

Amelia Campbell

The beginning of October saw the long awaited pest control conference held at the British Museum. It was a joint conference, organised by the Science Museum, English Heritage and the National Preservation Office. There was a huge interest in the conference with representatives from all over the globe, from Australia to Peru to Japan to list a few, with the delegates being from a number of different fields including conservators and curators from museums and galleries to chemical engineers.

The aim of the conference was to bring people together to discuss the problem of pest infestation in vulnerable collections, methods of dealing with it and the importance of an integrated pest management (IPM) policy for collections.

Everybody knows the impact of a pest attack on a collection, from the relatively small damage caused by the chewing of glue on labels to the damage they can do in devastating dry mounted botanical or entomological specimens. There were interesting talks on this subject by David Pinniger, a consultant used by many museums and institutions, including the Natural History Museum, who listed all the usual suspects that we see in temperate climates for example the Guernsey Carpet Beetle *Anthrenus sarnicus* and the Brown Carpet Beetle (nicknamed the vodka beetle) *Anthrenus smirnovi*. He also talked about a few new pests that might start cropping up, for example termites, which can be very destructive and have recently been found in Devon. A talk by Lydia Egunnike, Senior conservator from the State Library of Queensland in Brisbane gave us a taste of the types of pests they have to deal with in the tropics including possums, which have a tendency to create havoc if they get into the library and "marauding" geckos, both of which almost made the pests which we have in UK museums seem gentle by comparison.

There were a number of presentations on the methods of dealing with pest attacks which

started with a very interesting talk by Bob Child, the Head of Conservation at the National Museums and Galleries of Wales; he outlined the history of dealing with pest outbreaks, which mainly seemed to consist of spraying the infected area and objects with substances now known to be highly toxic and dangerous. Yvette Harvey of Kew Gardens told how in the past fumigation of infected materials was carried out by junior botanists using cyanide! Fortunately nowadays the treatments for pest infestation are far safer mainly due to the Control of Pesticides Regulation Act 1986. The methods employed for the treatment of infested specimens now seems to fall into three main categories.

* The treatment of pest infested material in an anoxic environment was discussed by a number of the speakers. This consists of placing the infected material in an airtight chamber with either a very low concentration of oxygen (<0.2%), high carbon dioxide concentration (>60%) or nitrogen treatment with the addition of oxygen scavengers to decrease the concentration of oxygen and kill the pests.

* The use of temperature to kill insect pests was also discussed in detail and seems to be the most economical and time saving method of dealing with a pest outbreak. Tom Strang of the Canadian Conservation Institute of Canadian Heritage gave an interesting talk on the methods of heating infested material to kill pests. He brought up many important points about the potentially damaging effects that heating may have on the materials and discussed different methods for heating of different materials. The easiest method of treating an infestation seems to be the freezing of material for a period of 72 hours in a -30(C freezer although of course this is only possible if you have a freezer large enough to house the specimens you want to freeze.

* The third method of dealing with an infestation and one that seems to be the last resort is the use of a pesticide which is highly effective but which may involve as yet unknown potential effects on health and possible damage to specimens. Dr Sagit Singh from Environmental Building Solutions Ltd

told how he sees the treatment of infestation using a pesticide as useless unless the source of the infestation is also located and eradicated.

The strong message throughout the conference was that the best method of controlling pests is to take steps to deny them access to the area in the first place. Lydia Egunnike told how in the State Library of Queensland there are designated eating areas and employees are not allowed to eat in the areas near the books so that the pests are not attracted to these sensitive areas. Another way of reducing the presence of pests is to try and remove the areas that harbour them. Val Blythe of the V&A told how the likely areas known to be attractive to pests are dead spaces, for example under cabinets and under false ceilings, and areas with links to the outside like heating vents; she suggested that if possible there should be a physical barrier so the pests cannot blunder their way in. Quarantine of incoming material is also important as it can stop any infected material getting into an otherwise pest free environment. The best procedure is to isolate and freeze the material before allowing it into the collection area. Janet Berry from the Department of Museum Studies at Leicester University explained the plan of action they took for the treatment of a pest infestation in the mounted mammal collection at Liverpool Museum from the initial examination of specimens for pest activity to the wrapping of the specimens and transportation to the Conservation Cold Room for programmed freezing.

The need for monitoring pest activity was strongly emphasised, otherwise by the time you notice that you have a pest problem there may have already been significant damage to vulnerable material. The pest monitoring of historic houses was presented by Amber Xavier-Rowe, the Head of Collections Conservation for English Heritage. Training courses are set up for the staff at these houses where they are instructed in the importance of pest monitoring and are trained to identify pests that they might encounter; this makes the task of monitoring pests in different locations much more efficient.

The final message at the conference was to reiterate the importance of pest control and pest management strategies as these pests can literally destroy the invaluable collections of a library or museum if left to happily chomp their way through unchecked.

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The Reconstitution of Dehydrated Museum Specimens III

Kenneth D Vogt

The evaporation of preservatives and subsequent dehydration of specimens is an on going problem in many zoological collections. Vogt (1991) reviewed existing methods and proposed a method of reconstituting specimens based on an acidic solution. Vogt (1998) provided a method based on a less acidic pH (6.5) for small specimens (larval and juvenile fish). This paper describes a method based on high pH (pH 10) for large specimens.

Methods

A wet weight of fifteen specimens of fish, amphibians, and squid was taken to the nearest hundredth of a gram on a Metler balance. Specimens were air-dried in a fume hood for four days. An additional nine fish specimens that were found dehydrated were also used in this experiment. Specimens were placed in individual containers with a solution containing one pH 10 buffer tablet per 100mls of water. The buffer tablets were produced by Micro Essential Laboratory, Brooklyn New York. Specimens were kept in the buffer solution for three weeks then transferred to a water bath for three weeks. A Kruskal-Wallis test (Conover, 1980) was used to compare the weight gains of large specimens in the Vogt (1991,1998) techniques and the technique reported here.

Results

The wet weight of specimens ranged from 191.06 to 387.75 grams. The dried weight of

the already dehydrated fish specimens ranged from 15.08 to 186.97 grams. The specimens showed an average gain of 91% of the original wet weight. Fins and jaws were malleable in the fish specimens; digits and jaws were malleable in the amphibian specimens. Arms and tentacles were malleable in the squid, but still retain much of their schivled appearance. The eyes did rehydrate and assumed a similar shape to the originally preserved specimens. The fish specimens that were discovered dehydrated showed an averaged gain (from dehydrated wet to wet weight) of 80%. Weight gains in specimens of similar weight were significantly higher than in the Vogt (1991) technique ($P=0.046$) and the Vogt (1998) technique ($P=0.003$).

Discussion

The buffer method lends itself to use with a variety of specimens. The preservation history seems to have an affect on the recovery of wet weight in this technique and in those reported previously (Vogt 1991, 1998). Specimens, which had the highest recovery, were either preserved in 70% ethanol or a commercially available glycol based solution, such as Carosafe or Wardsafe. Specimens that had a history of preservation in 50% or higher solutions of isopropanol and showed the typical hardness or brittleness did not show the same gains in wet weight as the specimens preserved in ethanol. The buffer tablets do not require any special storage procedures as acetic acid would and are available from most chemical supply companies. Dean (1995) lists the necessary chemicals to make one's own buffer solution if one have access to the chemicals.

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The Future of Collecting Collections of the Future Opportunities & Expectations

**Oxford University Museum,
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Joint BCG & NSCG Conference**

A number of reports have come out over the last few years detailing governments expectations for museums in areas such as social inclusion, life long learning, developing audiences and working with schools and community groups. Many of these address museums role as institutions, but what of museums defining element, their collections? How are biological collections being used and developed to meet these more explicit agendas?

The conference looked at how biological collections are used and cared for and how collections are being developed for more applied uses, rather than just repeating the mantra of what a marvellous resource collections are. The theme was a timely one as Resource had recently set up the Regional Museums Task Force seeking to develop a more unified strategic vision for museums. Their report is now out and an initial response from one BCG member can be found on page three.

The following are some of the papers presented at conference.

Biodiversity and the natural history museum - issues and opportunities.

Peter Davis

Wilson (1992) defines biodiversity as "The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families and still higher taxonomic levels; includes the variety of ecosystems, which comprise both the communities of organisms within particular habitats and the physical conditions under which they live". In essence it is the variety of life which has sustained and fascinated humankind; the variety of life which has been collected so avidly to stock museums and of which museums have taken stock.

The acceptance and usage of the term "biodiversity" is a product of the late 1980s, (and more widely used since the Earth Summit), but the threat to habitats and individual species is one of the major causes which has exercised the mind and energies of the environmental lobby since the 1960s. There is now widespread concern for the loss of species, and "the academic community of biology now sees the biodiversity crisis as a very real phenomenon meriting our closest scrutiny." (Eldredge, 1992).

The current biodiversity crisis differs from the previous five extinctions recorded in geological time in being caused by the unthinking actions of one species. Humans have been cited as a causal factor of the extinction of species (mammoth and ground sloths for example) as far back as the Pleistocene; there is strong circumstantial evidence to link the collapse of diversity of late-Pleistocene faunas with the influx of man in North America, Madagascar and New Zealand. The first Maoris, colonising New Zealand around 1000 A.D. found about thirteen species of large flightless birds - the moas - which had evolved to fill the niches normally taken by mammals, which were absent on these remote islands. All moa species had been hunted to extinction by

about 1300. This is just one well-known example of species extinction - other notable fatalities include the Dodo, Great Auk, Passenger Pigeon, Carolina Parakeet and Quagga - specimens of which are now treasured by many museums. Although all these species were hunted to extinction, other factors equally culpable were habitat destruction, the introduction of exotic, competitive species, and the spread of disease carried by such exotics - the effect was dramatic, on the landscape and on habitats, as well as on species. If hunting was the primary cause of extinctions up until the end of the 19th century, there can be little doubt that habitat destruction has taken its place as the root cause of the biodiversity crisis - not through human malevolence, but simply the growing demands for living space and natural resources. Much of the loss of habitat is recent - Wilson (1992) cites a number of examples including that of Madagascar. With its spectacular endemic animals, including 30 primates, (all lemurs), and two thirds of the world's chameleons and an estimated 10,000 plant species about 80% of which are endemic - "In 1985 the forest remaining intact was down to a third of the cover encountered by the first colonists fifteen centuries ago. The destruction is accelerating along with population growth, with most of the loss having occurred since 1950." It is inevitable that the greatest loss of species will be felt in parts of the world, like Madagascar, with greatest diversity of species - the so-called "hot-spots" - it is here that biodiversity research and conservation efforts must be concentrated. Natural history museums should be playing a major role in these localities.

Biodiversity - a global political issue.

The "Earth Summit" in Rio brought together well over 100 heads of state and government, and involved no less than 178 countries. The end result was five major agreements - *Forest Principles* (a failed attempt to negotiate a forest convention), *The Rio Declaration* (covering environment and development), *Agenda 21* (an action plan for sustainable development), the *Framework Convention on Climate Change* (seeking to reduce the emission of "greenhouse" gases) and the

Convention on Biological Diversity, which focuses on the preservation of species diversity and seeks to establish guidelines for the use of biological resources and biotechnology. Biological diversity has been the focus of natural history museums from the 18th century; consequently the Biodiversity Convention is of immense importance to museum biologists, especially those engaged in taxonomic research. Particularly relevant is the fact that making biodiversity a political issue, and providing international legislation, may release funds for the urgent taxonomic work which is required in order to document the world's biological resources. It is clear that in the UK much progress has been made since Rio, with increased collaborative effort and (in some quarters) greater recognition of the value of natural history collections.

The Biodiversity Convention preamble stresses the "ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic" values of maintaining species diversity. One might apply the same values to natural history collections. Under Article 7, each country is required "... as far as possible and as appropriate" to "identify components of biological diversity important for its conservation and sustainable use" whilst "paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use". There is a prerequisite for producing inventories of species and to assess which are rare or endangered; from this data appropriate conservation strategies can be formulated. Museums, and museum biologists, must be at the cutting edge of such taxonomic and biogeographical studies; the science of systematics and taxonomy carried out in the world's great natural history museums now has increased relevance and purpose.

Biological collections - some inherited problems and the consequences for the museum's role in sustaining biodiversity.

a) Recognising that environmentalism is important

Interestingly, within the museum world of the 1960s little reference was made to the loss of

species, or to the museum role in conservation (e.g. Oliver, 1969); taxonomic research took centre stage, with only passing reference to the potential benefits of that research for environmental protection (Netting, 1962). Yet the impact of environmentalism was such that in the United States a major review of the nation's biological collections carried out in the early 1970s pivoted around the theme of biological conservation - "the very cornerstones to studying, understanding and managing natural ecosystems are the systematic collections of the plant and animal species of the world ... the major systematic collections are essential complementary components of a system which catalogs the world biota, and which deserves strong support by this nation to assure our gaining essential insights into our own relationship to that tortured biota" (Conference of Directors of Systematic Collections, 1971). This emotive statement is itself a strong reflection of the mood of the times, a statement of the impact that environmentalism had made. The realisation of the central role of biological collections in biodiversity studies has continued to gain ground since the 1970s, and many museum directors (especially in the USA) have publicly stated their institutions' commitment to the role of preserving the Earth's biological diversity (e.g. Nicholson, 1991; Novacek, 1990).

But how well-equipped are museums in the mid-1990s to become involved in the fight to save the planet's plants and animals? It is salutary to compare the readiness of larger institutions in North America to adopt the environmental cause to the situation in Britain, where despite the best efforts of museum biologists, progress is constantly hampered by funding crises and conflicting priorities. The legacy of past collecting policies, the perceived low status of natural history collections (especially in multi-disciplinary museums), pose many problems which need to be solved if museums are to become key players in maintaining biodiversity. The downgrading of systematics as an academic discipline, and a lack of understanding of the significance of its role, is of equal concern.

b) The scale and nature of collections

The urge to collect natural history specimens has resulted in collections of tremendous scale and diversity in the museums of the world's developed countries, which we can identify as a strength and a weakness. Large-scale natural history collections were made for two main reasons - firstly to provide education and enjoyment for the general public (often focusing on large and attractive organisms, especially birds and mammals) and second, for taxonomic and biogeographic research. The latter frequently had little or nothing to do with any educational or conservationist aim - it was scientific research for its own sake. Past collecting efforts in both these categories, despite their often seemingly random nature, can only now be appreciated, as the collections begin to realise new meaning and significance - for example, the well-documented use of biological collections in determining the increase in pollutants in the environment (e.g. Johnels, 1973). In this, and many other ways, (see Pettitt, 1991 and 1994, Danks, 1991, Wiggins et al, 1991) historical collections housed in museums and other institutions chart our understanding of the earth's fauna and flora and its past distribution - our collections and their associated data give us a unique view of past worlds, and a yardstick with which to measure change. But - and here is the weakness - these collections can only be useful if they are well-documented and the data readily accessible. And when we know what our collection strengths are, should we be re-assessing the material, and even contemplating disposal?

c) Where are the named and significant collections?

Some specialist private collections rivalled those of the national museums - the shell collection of Hugh Cuming (1791-1865) was estimated to contain 52,789 specimens, including many types in 1846 (Barber, 1980); Walter Rothschild (1868-1937) used his fortune to establish his personal museum at Tring in Hertfordshire, the largest collection in natural history ever assembled by one man. Rothschild employed more than 400 collectors throughout the world - the resulting

collections being used to describe more than 5,000 new species and subspecies (Purcell and Gould, 1992). These (and many other) great collections are well-known, and made an enormous contribution to our understanding of the diversity of life, yet throughout Britain, and much of the world, other individuals were making collections on a smaller scale - most of the important individual collections found their way into museums. The number of such "named" 19th and early 20th century collections held in museums is still not yet known, but the preparation of individual catalogues of natural history collections held in museums and other institutions in the various regions of Britain (e.g. Davis and Brewer, 1988) have done much to reveal their size, strengths and diversity. There is no doubt that it is an enormous resource for the understanding of biodiversity; collections of international significance can be found in the most unsuspected institutions, and even the smallest local museum may hold collections which help to reveal the status of species and the significance of biological and geological sites in its area - the most important prerequisite to any conservation effort. We, as curators, need to be able to recognise the significance of this material and make such information widely known.

d) The geographical component in collections

Often led by charismatic and individual directors, there can be little doubt that personal, civic, national and institutional pride fuelled by a sense of competition, spurred museums to finance substantial collecting expeditions (as in the United States) or encourage the purchase and donation of collections (as in the U.K.). There were few thoughts of collaboration between museums on collecting policies in the 19th and early 20th centuries, no "National Plans" for systematic collections and collecting emerged until the 1970s (see Irwin *et. al.*, 1973). As a consequence there has been little specialisation by individual institutions, and every major museum has collections which cover "popular" taxa such as Lepidoptera, Mollusca or Mammalia. Similarly, geographical boundaries of collecting activity received only lip-service, and hence

collections in most major museums reflect a haphazard and sometimes bizarre geographical distribution pattern. The lack of a clearly defined collecting policy has meant that provincial museums have frequently accepted as donations material which lies well beyond their geographic sphere of influence and which they frequently have neither the expertise nor funding to curate and conserve, let alone actively research. This might, to the outsider, seem an unprofessional approach. However, as donations frequently come from nearby research institutions or individuals who have some association with the museum, but whose collecting area (geographically and taxonomically) falls well outside that of the museum, they are difficult if not impossible to refuse - curators are regularly compromised by such links. The Hancock Museum in Newcastle upon Tyne, perfectly illustrates the wayward nature of past collecting, holding, for example, a collection of Australian land-shell (including type specimens) collected by George French Angas (1822-1886), the C. H. E. Adamson (d. 1930) collection of Burmese butterflies, and a worldwide collection of micro-crustacea of international significance made by George Stewardson Brady (1832-1921). There seems to be little logic in such collections being curated in the north of England, but the reason is simply that all three collectors had strong links with the city of Newcastle and its Natural History Society, which ran the museum.

This situation is repeated worldwide; for example, in France's 187 provincial natural history museums " ... sont conservées plusieurs dizaines de millions d'échantillons et de spécimens. Ils sont des témoins non seulement de l'histoire naturelle de notre pays mais aussi du monde entier ... " (Leclaire, 1989). This worldwide scatter of collections has prompted some individuals (e.g. Haas, 1993) and organisations to suggest repatriation as a solution, in particular when collections are poorly-curated or under-utilised. The Royal Society in its evidence to the Dainton enquiry (Dainton, 1991, 6.23) suggested the cost of curation might be mitigated by "relocating specific collections via long-term loan to relevant user groups in other countries ...". Some evidence of this actually occurring is the

transfer of a collection of Irish Lepidoptera to the Ulster Museum, Belfast, from the Smithsonian (John Wilson, *pers. comm.*). The arguments for maintaining the integrity of the UK collections (the ability to compare material, concerns about repatriation to developing countries) are much stronger, yet there is little doubt that as a consequence of historical collecting a huge amount of information vital to the biodiversity cause is locked away, seemingly inaccessible, and is another challenge to us as curators. However, the increasing number of collections databases compiled by museums, and their availability on line over the internet has revolutionised this situation, and the numerous biodiversity servers indicate the progress that has been made.

e) Conservation needs of collections

However, according to Howie (1993) the priceless archive (an estimated 2 billion specimens) has "... been slowly deteriorating over the past two centuries. The extent and understanding of the processes involved are as yet largely undocumented and unknown ... recent surveys ... reveal that some areas are at crisis point through the unchecked growth of collections, poor training in conservation and collection management procedures, and pure indifference." The condition of many natural history collections prompts Howie to the conclude that "... a third of the world's natural history collections is in an extremely poor state with possibly as many as thirty million specimens per year deteriorating to the extent that they are of no future benefit."

Clearly there is a real problem here if the collections held in museums are to be of any value to the needs of the biodiversity crisis. There is a real need for better collections management and improved conservation facilities, for funding which would enable research on conservation problems and techniques, and above all a commitment of management to the preservation of collections. The formation of specific organisations such as the National Institute for the Conservation of Cultural Property (NIC) (1973), the Society for the Preservation of Natural History Collections (SPNHC) (1985) in the USA and

the Natural Sciences Division of the United Kingdom Institute for Conservation (UKIC) (1993) has meant a growing voice for the needs of collections, and a focus for improving standards of collection care.

f) Patterns of biodiversity and the distribution of natural history museums

A simplified view of the pattern of biological diversity is that it is greatest in the equatorial regions, especially in areas of tropical forest, becoming less diverse with increasing latitude. This pattern seems to hold true for larger vertebrates and higher plants, but has been questioned for some invertebrate groups, for example, spiders Platnick (1992). This generalised pattern of distribution suggests that as a consequence the greatest loss of biodiversity is occurring in equatorial, often developing countries, and it is here that systematic collecting of biological material is most urgently required in order to determine which areas are of greatest significance and to promote active conservation policies for them.

Those developing countries are facing a real dilemma as a result - many lack the systematics skills required, many do not have a national museum of natural history of any standing. The very real economic pressures such countries face mean that insufficient resources can be put into scientific education, museums or environmental protection. If biodiversity is to be considered as a global resource, as the Rio declaration has suggested, then equally the global scientific community has an obligation to work with developing countries, to develop scientific research programmes and to implement systematics training. Natural history museums are well-placed to guide and conduct research and to influence public opinion in developing countries. There is a real need to promote museum developments, and to ensure that staff are trained in systematics and collections management.

Mares (1993) has made a comparative study of the development of museums in the United States and in the countries of South America; he notes that by 1992 "there were 1500 natural history related organizations in the United

States (1176 actual natural history museums) compared with only 412 organizations in all of Latin America (326 actual museums) and that "... without the prodigious efforts of thousands of research biologists from throughout the world, there is little doubt that the taxonomic and ecological information available on the biota of the Americas would be poor indeed." However, the end result of this scientific (often museum-based) activity in developing countries is that the majority of the material evidence of their biodiversity is now housed in remote institutions in the 'north' and information vital to the conservationists on the ground is inaccessible.

Perhaps the natural history museum community's greatest challenge is to assist the growth of natural history museums in developing countries. The disproportionate distribution of the 6294 natural history museums in the world in 1992 has been described by Mares (1993), who states "The number of museums located within any country is a function of the economic well-being of that country ... there are more museums in the United States than in all other American countries combined. In the Old World, the pattern is similar. Indeed, countries with high per capita incomes have 2.5 times as many museums as countries with low per capita incomes, although there are only twenty-seven developed countries versus 137 developing nations." He has demonstrated convincingly that not only is there a direct relationship between the number of natural history museums and per capita income within a country, but also a significant relationship between population size and number of museums once a threshold of personal income has been passed.

g) The lack of networking

There is clearly a need to develop a worldwide network of natural history museums which, wherever they are, face the same essential challenges of collecting, preserving and interpreting the natural heritage. The promotion of co-operative scientific and educational programmes between institutions in developed and developing countries must be seen as a matter of some urgency, and was

recognised at the Madrid Conference, when the WCCR was mandated to "promote efforts to establish regional training centres in one or more developing countries, particularly in tropical regions, to train natural history museum collection managers and conservators to properly maintain collections in tropical regions." (Anon, 1992).

I don't know what has happened to the WCCR – no web site seems to exist for the organisation. However, in terms of biodiversity beyond the museum, it is very clear that networking has improved dramatically since publication of *Museums and the Natural Environment* (Davis, 1996). So, for example, the Biodiversity Servers website (<http://darwin/eeb.uconn.edu/biodiversity.html>) gives a vivid picture of active and professional biodiversity networking. But to what extent are natural history museums plugged into these systems?

h) Ethical issues - to collect or not to collect?

Tattersall (1992) commented that "in a world where both ecological communities and large numbers of systematic groups are under threat everywhere, museums will in some areas at least find it increasingly difficult, or often impossible, to continue collecting the kinds of material of which they have built up their collections over the past couple of centuries. And indeed, no responsible museum professional would wish to add to the stress upon populations already on the brink of disappearance. Thus a change of emphasis seems not only desirable but mandated." The museum biologist has always faced an ethical dilemma with regard to collecting specimens - yet if we are to document fully an area's biological diversity, there is no alternative but to collect for most taxa.

Ethical considerations are now compounded by practical problems - in many developing countries the enforcement of new laws relating to the collection and export of natural history material (usually to limit wildlife trade as a national response to the demands of CITES) is already influencing the way in which museums can collect, sometimes to the

detriment of our understanding of the biodiversity of those countries. Similarly, the Biodiversity Convention has resulted in the need for greater control over the movement of specimens - botanical gardens, with their propensity to move plants and seed, have been especially affected, with many gardens using documentation rigorously to control the exchange of living material (Nelson, *pers. comm.*). It is quite probable that these activities, when compared to the impact on biodiversity of illegal (and legal) trade in animals, plants and derivatives for non-scientific purposes are trivial (Braun and Mares, 1991).

Mahan (1980) proposed an "International Ethics Code for Natural History Museums" which sets out broad guidelines for the museum curator, and explores the ethics of field collecting. It is unfortunate that this document has not been more widely circulated, as it sets practical and attainable standards, including the prerequisite for careful planning of expeditions and the disclosure of findings, as well as stressing the need for appropriate conduct when in other countries. As he notes "Being a member of a scientific team and having authority to collect, does not absolve a museum worker from observing the principles of good conservation ... nor permit him to behave in a callous or inhumane fashion." An important part of ethical collecting is being aware of wildlife legislation, particularly as it relates to endangered species, and complying with it (Saito, 1993). It is interesting to note that the Madrid Conference Resolutions called for "Rapid and *focused* surveys and inventories of the Earth's biota" (Anon, 1993), a strong indication that the international museum community has recognised the need for selective collecting, and that the conservation ethic is firmly established.

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Should local authority museums be collecting natural history?

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Natural history collections in local authority museums, as for all collections in all institutions, must be able to justify their existence if they are to survive. Collecting itself is essential to the development of a collection and must be justified confidently, precisely and vigorously in order to continue. 'Collections and collecting are after all the very essence of museum practice.'¹

Justifications for keeping natural history collections.

A major reason to collect natural history is to augment valuable collections. However, the value of natural history is a huge topic and much time and writing space has been dedicated to it. This article concentrates on the reasons for and against collecting. For more in depth analysis of the justifications for keeping natural history see: Pettit, C., 'Putting 'Bloody Mice' to Good Use', *Museums Journal*, (August 1991), 25-7; Nudds, J. R. and Pettit, C. W., eds., *The value and valuation of Natural Science Collections* (London: The Geographical Society, 1997).

Current Collecting Trends

In the summer of 2000, most Local authority museums were increasing their natural history collections (Table 1).

Whether they should be or not, local authority museums are currently collecting natural history. Of the two museums not expanding their collection in this study, Leeds Museum is currently 'static collecting,' due to space and money problems and the Yorkshire Museum's natural history department has also been forbidden to collect before its 'backlog' has been cleared. Nevertheless, they were still able to say through what means they normally collect (displaying a strong presumption to collect) suggesting that the termination of collecting is a 'pause' rather than a permanent arrangement. Table 2 shows the methods of collecting in the eight museums used in this study.

The large standard deviation is due to the small sample size as well as the variability of the data. This variation in collecting habits is a reflection of the resources available to each museum as well as the personal preferences of the curators involved.

Collecting Policies

Although the museums in this survey are collecting in a variety of different ways and at a variety of different rates their collecting policies all contain similar points e.g. geography and legality. A few discuss deeper aspects of collecting, for example the Hancock Museum's collecting policy states that 'it is the collection and its association with a particular place, time and person that is important. It is for this reason that the data that

Institution	Number of accessions per year
Bolton Museum, Art Gallery and Aquarium	~20
Bristol City Museum and Art Gallery	1 – 10
Hancock Museum (Newcastle)	<6
Hull Museums and Art Galleries	~30
Leeds Museum Resource Centre	0
Leicester City Museum Service	~200
Norwich Museum Service	~18
The Potteries Museum and Art Gallery (Stoke)	~1000
Sheffield City Museum	~150
Wollerton Hall (Nottingham)	~100
Yorkshire Museum	0

Table 1: The speed at which certain museums are adding to their collections every year.

Institution	Donation	Field Collection	Purchase
Bolton Museum	Z 98% B 20%	Z 0% B 78%	Z 2% B 2%
Bristol City Museum	99%	1%	0%
Hancock Museum (Newcastle)	100%	0%	0%
Hull Museums and Art Galleries	50%	50%	0%
Leeds Museum Resource Centre	90%	5%	5%
Leicester City Museum Service	50%	45%	5%
Norwich Museum Service	No data	No data	No data
The Potteries Museum (Stoke)	90%	8%	2%
Sheffield City Museum	5%	95%	0%
Wollerton Hall (Nottingham)	10%	89%	1%
Yorkshire Museum	90%	5%	5%
Mean	63.82%	34.18%	2%
Standard Deviation	37.98	38.49	2.10
95% Confidence Limit	38.31 < μ < 89.33	8.31 < μ < 60.05	0.60 < μ < 3.40

Z = zoological collection, B = botanical collection

Table 2: The methods by which certain museums collect.

accompanies collections is vital.² and Bristol City Museum's states that 'all collecting will be pursued with restraint and due regard to safeguarding individual species, population and habitats.'³

Policies did not often consider why the museum collects, they only observed that it does. For justification of collecting the collectors themselves, the curators, are answerable.

Environmental recording

Environmental recording has become a major function of local authority museums, indeed they helped to create the environmental recording movement.⁵ For physical data on the state of species at present, researchers in the future will have to rely almost solely on the efforts of museums and Biological Records Centres.

In having up to date records, building developments and council planning departments, can assess whether or not the habitat they are about to develop is of biological significance. Planners are 'required by law to take wildlife into account when assessing planning applications'⁶ and councils can turn down a development proposal if the biology of the location is significant and compromised.⁷

Voucher Specimens

'Without voucher specimens, ... costly, time consuming research ... may be unsalvageable.'⁸ For example, 'two large and

expensive surveys, one for a river valley authority in America and one for an oil company, failed to preserve voucher material in a permanent collection. Both surveys were carried out by recent graduates with little taxonomic experience, and their findings have since been successfully challenged.'⁹ If museums did not collect, then voucher material may not be so well cared for or even not preserved at all.

Information for the future

In 1910, Joseph Grinnell, the director of the Museum of Vertebrate Zoology at Berkeley, U.S.A., wrote, 'I wish to emphasize what I believe will ultimately prove to be the greatest value of our museum. - And this is that the student of the future will have access to the original record of faunal conditions in California and the west wherever we work now.'¹⁰ Grinnell was laying down what was to become one of the most fundamental reasons for collecting: future research.

There are many examples of studies for which it seems very unlikely that the original collector could have foreseen their collection's future use. For example, the study by Radcliffe in 1967 of the effects of the chlorinated hydrocarbons (among them the infamous DDT) on bird eggshell thickness led to the pesticide being banned.¹¹

Natural history collections, because of the information they contain, are treasure-troves for present and future research. 'Bewildering as the masses of accumulated items may be,

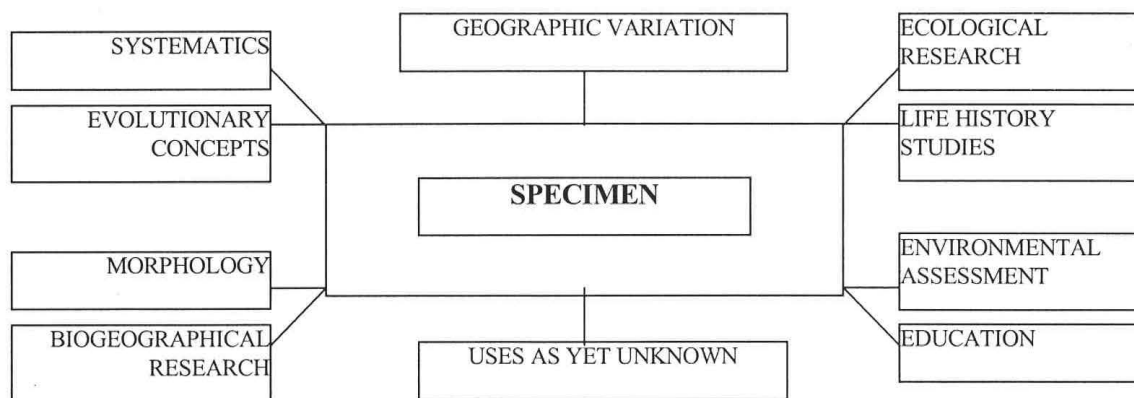


Figure 3: The uses of a collected specimen (after Cambray).⁴

they remain one of the most precious resources of mankind.¹²

Because we cannot see the future and because it is impossible to collect everything, 'sensible' collecting is the best that can be done currently. You have to assume that new techniques will become available to use on the specimens you are collecting now.¹³

However, several of the curators interviewed for this study talked about how little research they carried out on their collection.¹⁴ How can museums guarantee that research will happen in the future if it is not happening now? To help justify collecting then more research may have to take place now.

Although collections are being used, only a small number of people are using them.¹⁵ Local authority museums need to advertise the huge resource they have and encourage the use of collections not only for reference but also for exploration by the public. Museums should be promoting their resources and encouraging research if they want to make full use of what they have.¹⁶ Research is a large part of the function of museums in other countries, why not in the UK? Some say that without research, collections will not survive.^{17 18}

**'A static museum is a dead museum.'¹⁹
What happens if a museum stops collecting?**

Some believe that without collecting museums 'will lose their memory function; they will cease to be living institutions but rather fossilised monuments to a vanished age.'²⁰ If they are perceived as out of date or not developing with time, they are easier to get rid of. Stopping collecting could be perceived as stopping being relevant, 'if you stopped being relevant to the present day then there [would] be a greater chance that [natural history] would just become obsolete.'²¹

However, collections remain collections if they are being added to, or not. If anything, they might improve because more time would be spent on their maintenance.

Collecting can 'lead to a loss of normal reason.'²² The problems for Local authority museums of collecting natural history.

Resources

Caring for specimens is, usually, more costly than collecting them.²³ However, the gathering and preparation of specimens requires a lot of work, time, space and finance.²⁴ If museums cannot afford these then should they be collecting at all?

When asked the question 'What problems do you have with an expanding collection?' nearly all the curators interviewed said 'space' immediately.²⁵ Funding, staffing and time were also given as major problems.

Funding for local authority museums is notoriously scarce and changeable and even careful allocation of resources using detailed long term plans and audits cannot help much if there is only 'one storeroom and twenty quid.'²⁶

Local authority museums are struggling to maintain their collections at a satisfactory level, adding to them can just make the problem worse. One curator said that, 'unless you can store [collections] and look after them properly then you don't have them.'²⁷ 'We have touched the ceiling of growth both physically and financially.'²⁸

Backlog

Can museums really justify adding to the 'conservation mountain' when resources are so short anyway?²⁹

The implications of uncleared backlog can be far reaching. One of the criteria for registration is proof of a policy for keeping documentation in support of the collection. 'The principles are that a museum should know at any time exactly for what items it is legally responsible, and where each item is located.'³⁰ More fundamental than losing registration status is the sharp decrease in access to the collection, and its information, if it is not properly documented.

However, most museums are attempting to reduce the size of their 'to do' list, Stuart Ogilvy, at the Yorkshire Museum, said that ceasing collecting to clear backlog 'may be slightly irksome but there are very good reasons for it.'

'Natural history in provincial museums means stuffed birds.'³¹ Public Perception

Because Local authority museums are ultimately funded from the public purse, what the public thinks and feels about museums collecting biological material, especially when it is killed specifically for the purpose, must feature when considering natural history collecting. If the local community object to any practices of the museum, they are within their rights, as contributors to it, to question its function.

Investigating commissioners in Sweden found that the public 'know neither how or why museums collect, and consequently question the very need.'³² Some of the public regard curators as the 'last bastion of the "shoot first, ask questions later" fraternity' even though curators see themselves as being at the forefront of conservation education.³³

One curator remarked: 'If we don't increase access and show people what we've got, we keep it hidden, we're not going to survive.'³⁴

Degradation and relevance of material.

'Experience suggests ... that only 10% of collections can be preserved (well).'³⁵ What then is the point of collecting material for future research if it is unlikely to be permanently preserved?

Dunn noted that objects may 'alter their status within a collection, and may even slip outside a museum's interest.'³⁶ Can collecting be justified if the specimen may eventually 'slip outside a museum's interest'?

Is collecting out of date and fuelled only by tradition?

Sola believes that 'the philosophy [of modern curators] is one of acquire now think later' and also supposes that the 'pressure for quantitative perfection' is still too strong for collecting to cease or slow down.³⁷ This implies that museums are still collecting for collecting's sake.

If it is truly the case that museums are continuing to collect because they always have done, then they will not be able to endure. However, none of the curators interviewed were at a loss to give the reasons why they collected and 'because we always have' was

not one of them.

Population numbers and environmentalism

Some believe that natural habitats all over the world have been 'disturbed and destroyed' by over zealous collecting.³⁸ Individual species definitely have:

'On 4th June 1844, three fishermen made a trip to the island of Eldey, off Iceland, hired by a bird collector, Carl Siemson, to get specimens of [the Great Auk]. One fisherman had to return empty-handed, for his colleagues had just destroyed the last two Great Auks in existence. Siemson had these stuffed and later sold them to a museum.'³⁹

Fortunately, these stories are historic rather than modern (we hope) but the issue of environmentalism is perhaps the hardest objection a museum collector must overcome. The ethical considerations do not necessarily produce a straightforward answer either for or against. Indiscriminate, haphazard collecting is unjustifiable; it has occurred too regularly in the past and accounts for too large a portion of current natural history collections.⁴⁰ 'How often do these collections play a vital role in the function of the museum today?'⁴¹ We cannot prove conclusively that killing organisms for museum collections will help save the remaining population and/or habitat, but through research and education there is a good chance that it will.

Conclusion

Museums need to continue to educate both the public and their funding bodies about natural history and collecting to turn around the perception that collecting is 'misguided and ill thought out.'⁴² Curators can argue for resources more effectively if a potential backer is more aware of the issues. It is a museum's 'societal responsibility' to put this information out there.⁴³

Behaving responsibly towards collecting is an obvious, but essential factor, in justifying it. In order to assure the 'maximum utility of each animal' and 'minimise the need for duplicate collecting,' appropriate preparation for preservation of material is required.⁴⁴ A museum cannot justify collecting something that is unlikely to survive or be useful; it nullifies all the original reasons for keeping it.

Strategic, sensible planning for the future will greatly aid the chance of a museum's place in it.

A method of collecting that was often advocated by curators, when being interviewed for this dissertation, was the concept of specialisation. Curators' own expertise could be used to develop certain areas of a collection. This way, certain niches in the collection would be of an excellent standard, rather than the whole collection being improved only gradually. One curator commented that perhaps curators should shift jobs every few years in order to develop other collections and allow the collections they leave behind to be developed by a curator with different interests.

Although collecting for recognised research projects (rather than collecting everything in the hope of producing something useful for the future) has many advocates, it remains a restrictive method leading to the exclusion of large amounts of potentially crucial material. Although this may be positive for a museum faced with dwindling resources, it could result in larger problems in the future.

Ethical considerations are far reaching and circumstances are different for each individual object and for each individual collection. There do not seem to be many clean cut definitive arguments for or against collecting that cover every eventuality. Collecting natural history is so beneficial in many areas but responsible collecting and solid justifications for that collecting are the only way for it to proceed.

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This article is a condensed version of a dissertation written in 2000 for the degree of MSc Museums Studies at the University of Leicester. If you would like a full copy of the dissertation please contact the Editor.

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The Role of Biological Collections in Undergraduate Teaching

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Natural history collections provide a wealth of material for teaching biology to undergraduates. Why is it then that the use of these marvellous resources for educational purposes at a tertiary level has declined dramatically in the last two decades? With a steady decline in the number of whole-organism biologists being employed by universities and the ever-increasing demands on space and funding, the very existence of university teaching collections has been threatened, with many institutions suffering the loss of their valuable and irreplaceable collections. It seems that with the present trend towards a more molecular and cellular approach to biology, the role that collections play in undergraduate teaching is no longer valued. This may, in part, be explained by the apparent lack of understanding of what that role is. The aim of this article is to present some of the key benefits to be gained using natural history collections as a teaching resource for undergraduates in the biological sciences.

The main reason that natural history collections are marvellous resources for undergraduate teaching is that when used in a thoughtful way they allow a structured learning experience, especially when used in a practical or tutorial context. Within this strategic framework, the use of collections allows a process of 'active learning'. Active learning can be defined as learning through instructional activities that involve students in doing things and thinking about what they are doing. This should be contrasted with 'passive learning' in which students may be listening or note taking but are not actively thinking and evaluating what they are doing at the time of the exercise. Teaching methods promoting active learning have been shown to be comparable to traditional lectures in promoting the understanding of facts but superior to lectures when it comes to promoting the development of cognitive and writing skills.

In a biological context the outcomes of the active learning process can be broadly divided into two areas: promoting understanding of biological concepts and developing good scientific methods and practical skills. The roles that collections play within these two areas are considered below.

Biological concepts

The precise biological knowledge and concepts that a student will be expected to gain when using a collection will ultimately depend on the subject being considered at any one time. However, it is worth mentioning here some of the more fundamental biological concepts, relevant to the education of any biology student, which can be demonstrated using a natural history collection.

Effective use of natural history collections can give students a sense of reality. Actual specimens can act as a focus for concepts and ideas and allow visual comprehension of size, form and structure in a way that illustrations or slides cannot. Similarly, an appreciation of the diversity of life can be gained from collections, as by their very nature they have been amassed to maximise diversity. This sense of reality can be extended into many other areas of biology. For instance, studying a real skeleton of an extinct animal will have a far greater impact on a student's understanding of extinction and its finality than looking at any textbook diagram.

Another fundamental biological concept is one of variation. As well as providing an insight into the diversity of species, museums can also provide an environment in which students can appreciate variation within a species. Biological variation is the subject of much scientific study whether it is structural, genetic or behavioural variation. Effective use of collections, especially specimen-rich collections, can allow students to appreciate morphological variation of individuals. Furthermore, an understanding of variation leads students to think directly about adaptation of organisms to environments and natural selection. Inevitably, natural selection is the basic principle around which biological courses are organised, and a thorough understanding of evolution has to be one of the ultimate learning objectives of any

biological degree.

Scientific methods and practical skills

Effective use of collections can play an important role in allowing students to expand their scientific methodology and practical skills within a biological context. Any structured active learning experience will allow students time to evaluate knowledge and put that knowledge into context. By applying them to specimens, the understanding of concepts can be tested. With the right direction and support specimens can be used to promote discussion and arouse curiosity, and help students develop skills in asking so-called 'why, what and how' questions; the development of an enquiring mind is a fundamental part of science education. In addition transferable, practical skills can be acquired and promoted. Skills such as observation, data acquisition, accuracy and communication are useful not just within a scientific context but for life in general.

An underlying factor in the role of collections for undergraduate teaching is their 'effective' use. Whilst discussing the uses of particular specimens is beyond the scope of this article, it is worth noting a few important requirements that need to be in place for effective teaching to take place. Firstly, suitable facilities must be available. Obviously access to a collection is necessary, but in addition, that collection needs to be accessible not just in the manner in which the general public views collections, but specimens need to be taken out from behind glass and placed into the immediate environment of the student. It follows that space in which this can take place needs to be provided. Secondly, teaching staff need to be willing to put in the time required to use collections. Preparation time for the structured and effective use of collections can be extensive. Questions and activities need to be carefully formulated for students to benefit from the experience; appropriate lines of tutorial support need to be in place. In addition, the circumnavigation of constraints imposed by space, class size and class time may require much ingenuity on behalf of the museum and teaching staff. Thirdly, a collection needs someone to manage and maintain it. Ideally, this would be

a dedicated museum curator. However, members of academic staff can take on this role given suitable training and with a realistic amount of time designated for the purpose.

Whatever the needs, however, it is hoped that the above paragraphs illustrate some of the important parts that biological collections play in tertiary-level education. Understanding this role is the first step towards reinstating the value of collections as a teaching resource within universities. When used in the right way collections provide a structured learning experience, promoting effective, active learning as well as enjoyable learning. They also produce enthusiastic, enquiring, communicative minds, which at the end of the day is what a university education is all about.

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Book Review



The Aurelian Legacy, by Michael A. Salmon (2000). Harley Books, Colchester. 432pp, 162 figs, 41 col. pls. Price: £30.00. ISBN 0-946589-40-2.

Butterfly collecting has been one of the most popular pursuits of naturalists for generations and few natural history collections lack at least a few specimens, albeit often in poor condition or with little data. This indispensable book provides a fascinating insight into the lives of the collectors, their methods of collecting and the places where they collected, thereby providing curators with an essential background to the collections that they care for.

The first chapter 'A short history of butterfly collecting in Britain', provides a useful overview of collectors and their collections and describes the origins of the Aurelian Societies in the coffee houses of London. In some ways this is almost a social history of entomology, describing changing attitudes towards the study of insects as natural history societies

sprang up in the nineteenth century. The author describes such Victorian lepidopterists as Henry Stainton as evangelists and this does not seem an overstatement when one reads the detailed accounts of their dedication in promoting the study of butterflies.

The following chapter describes the paraphernalia of butterfly collecting from the sixteenth century onwards, although there is an even earlier illustration of butterfly hunting from a mid fourteenth century Flemish manuscript. The latter part of this chapter deals with collections and cabinets and concludes with a delightful section entitled 'A day in the country', full of entertaining anecdotes about collecting trips and expeditions. The accounts really capture the joy of butterfly collecting as it must have been a hundred years ago when the wealding of a net was unlikely to provoke the disapproval of passers by.

One of the longest chapters deals with the biographies of 101 butterfly collectors, spanning more than three centuries and including artists, scientists, writers, rich and poor, with wonderful names such as Eleazar Albin, Moses Harris, Joseph Grimaldi (the famous clown), Lactitia Jermyn (the Fair Aurelian), Abel Inghen and John Obadiah Westwood. These biographies are arranged in chronological order but this is no dull catalogue as every entry is quite different in character and the entire chapter is packed with interesting and amusing facts, stories and observations. It is difficult to single out an example among so many but the story of Lady Eleanor Glanville (c.1654-1709) is particularly worth mention. After the breakdown of her second marriage to Richard Glanville, who had threatened to shoot her dead, she developed an interest in entomology - a contemporary described how 'she and her two apprentice girls would carry a sheet out under the hedges and bushes and with a long pole beat the said hedges and catch'd a parcel of wormes'. This behaviour, coupled with her unconventional 'gypsy' dress when out collecting, were used as evidence of madness when her family successfully contested her will - 'no one not deprived of their senses should go in pursuit of butterflies'. She is remembered today by the butterfly named after her - the Glanville Fritillary.

The other major section, more than 100 pages long, is entitled 'Some species of historical interest', a rather uninspiring title for yet another fascinating chapter, this time dealing with accounts of how our butterfly fauna was discovered and recorded, with particular emphasis on the rare and unusual, including species such as the Large Blue, Large Copper and Black-veined White which are sadly now extinct in Britain. The superb illustrations are a particular feature of this chapter, including photographs of specimens and superb reproductions of illustrations from rare and early entomological works. In fact the entire book is superbly illustrated with an amazing collection of photographs, portraits and reproductions of published works, which is a tribute to the author's excellent research.

A final, brief but thought-provoking chapter deals with the issues of conservation and collecting. Changing attitudes to collecting are chronicled at some length and one senses the author's sadness at current trends towards a society that demonises collectors. They are frequently blamed for the demise of butterfly populations although there is little evidence that their activities have had any significant effect in this respect. It is becoming increasingly evident that the recent decline in butterfly numbers is largely due to habitat change and destruction. Were it not for the activities of those enthusiastic aurelians of the past and their more recent successors, we would lack the knowledge of the biology and ecology of our butterfly fauna that is now so vital if we are to take the right measures to conserve it.

This book is produced to a high standard, with good design and superb colour work, and is extremely reasonably priced. I thoroughly recommend it to all naturalists and biology curators.

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